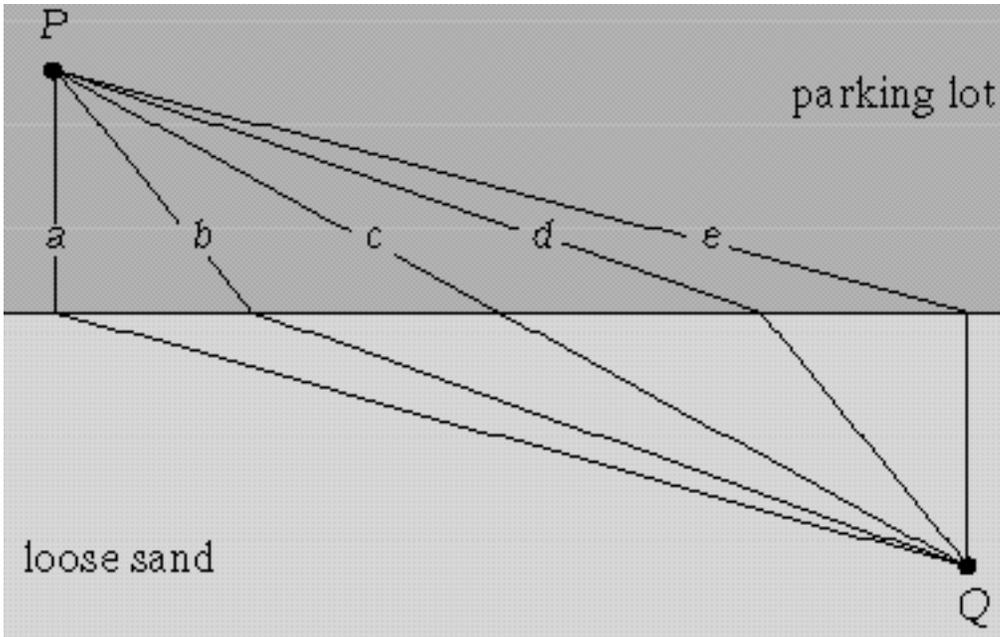


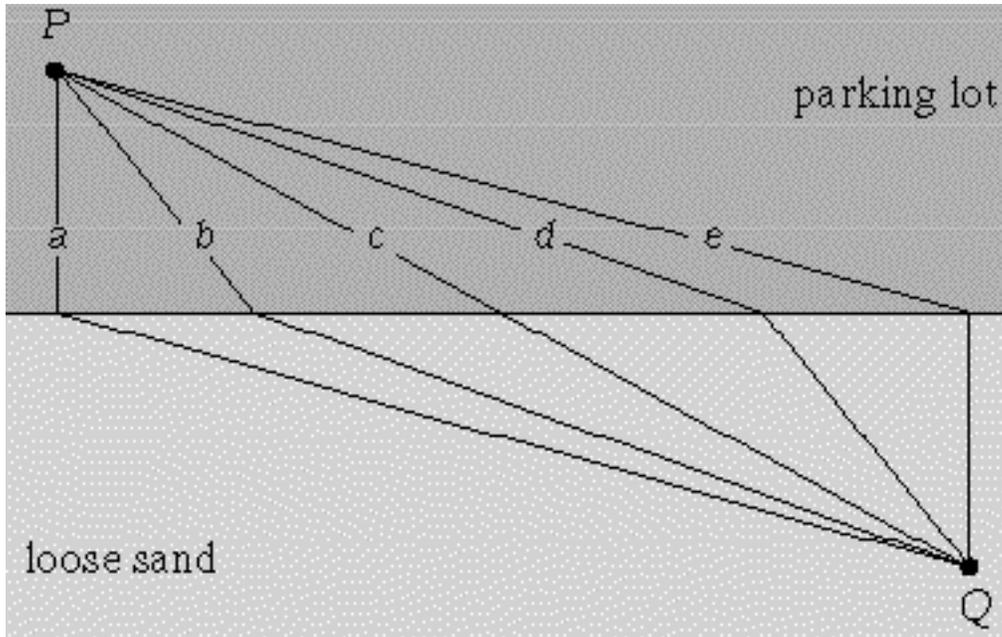
**CPS lesson**  
**Ray Optics**  
**ANSWER KEY**

1. A runner wants to get from P to Q as fast as he can. He can run faster on pavement than on sand. Which path should he take?



- A.
- B.
- C.
- \* D.
- E.

2. A runner wants to get from Q to P as fast as he can. He can run faster on pavement than on sand. Which path should he take?



- A.
- B.
- C.
- \* D.
- E.

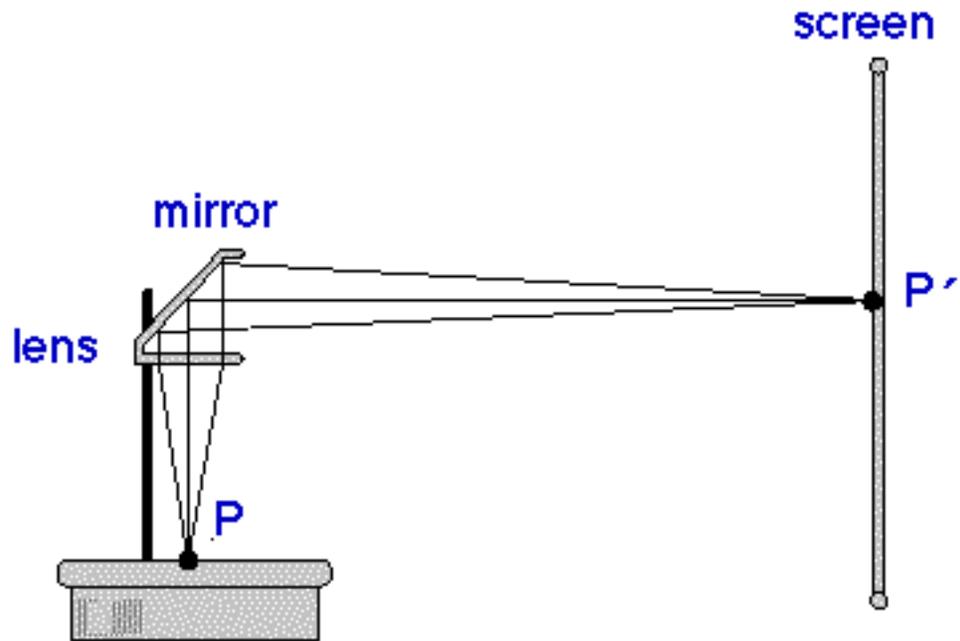
3.

A converging lens forms a real image on a screen. If the right half of the lens is covered up,

- A. the left half of the image disappears
- B. the right half of the image disappears
- C. the entire image disappears
- D. the image becomes blurry
- \* E. the image becomes fainter

4. An overhead projector forms an image of P at P'.

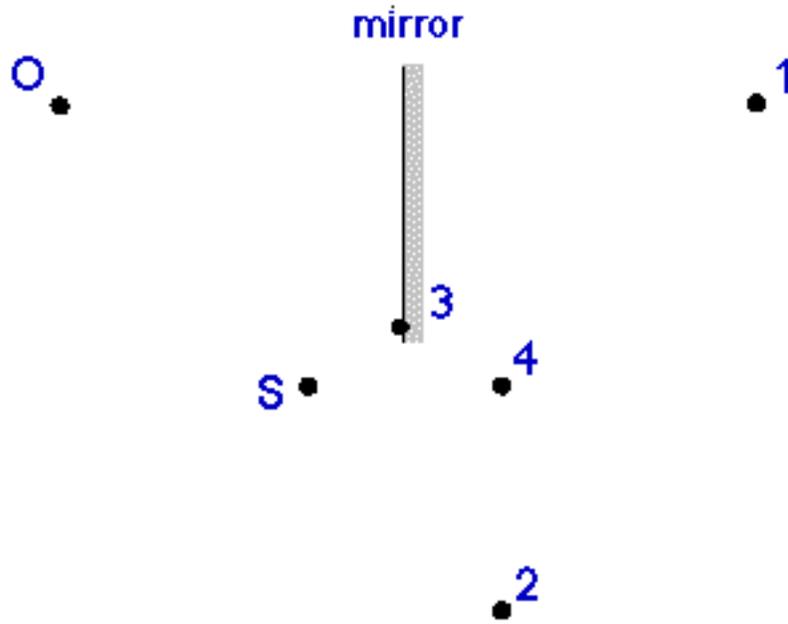
If the screen is moved closer to the projector, the lens has to be refocused by moving it:



- \* A. upward
- B. downward
- C. It doesn't need to be moved.

5.

Where does an observer at O perceive the mirror image of S to be located?



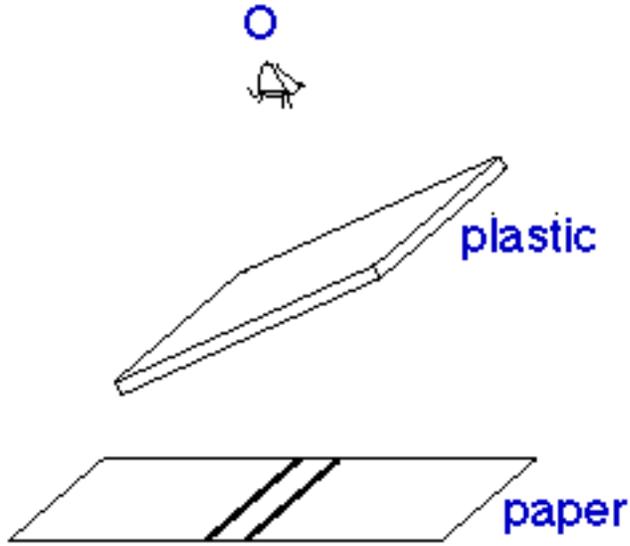
A. position 1

B. 2

C. 3

\* D. 4

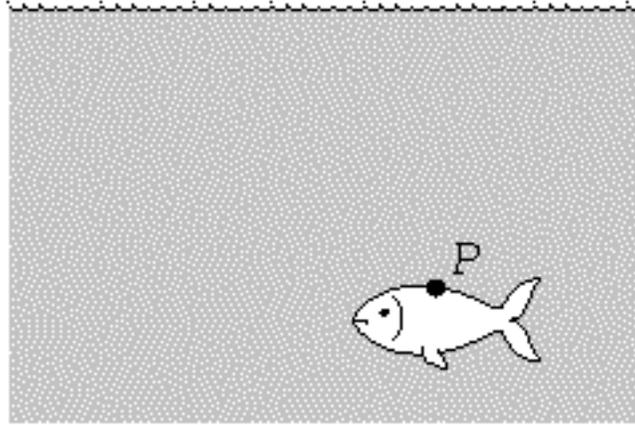
6.  
The observer O views two parallel lines through an angled plastic slab. The lines appear to be:



- A. shifted to the right
- \* B. shifted to the left
- C. spaced farther apart
- D. spaced closer together
- E. unchanged in any way

7.

The observer sees the fish at:



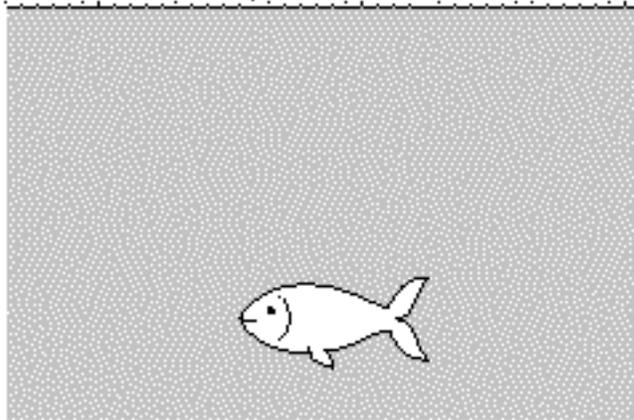
A. a greater depth than it really is

B. the same depth

\* C. a shallower depth than it really is

8.

The observer sees the fish at:



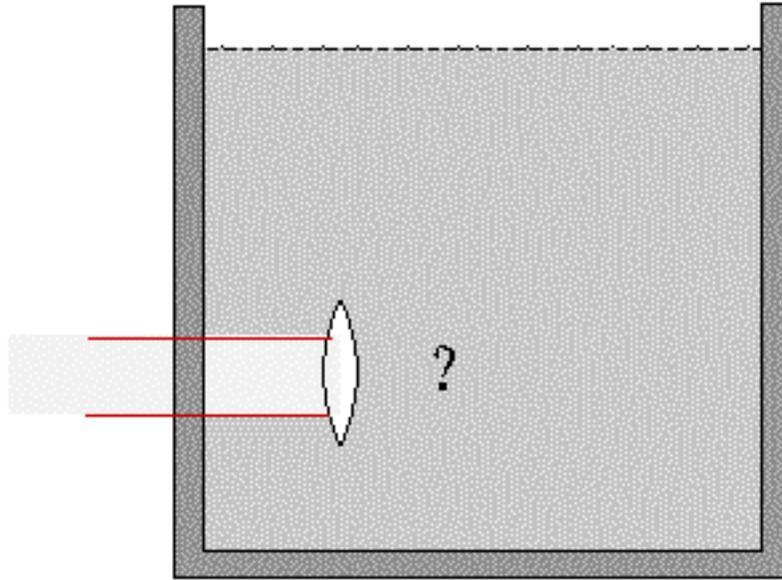
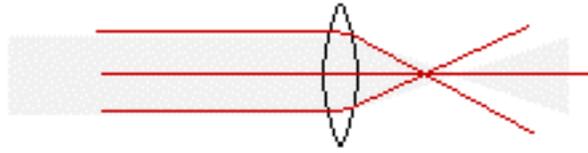
A. a greater depth than it really is

B. the same depth

\* C. a shallower depth than it really is

9.

Compared to the focal length in air, a convex lens in water focuses a flashlight beam:



- A. closer to the lens
- B. the same distance as in air
- \* C. farther from the lens

10. A corner cube is made of 3 plane mirrors at right angles, forming the corner of a cube. How many images can be seen of an object within the corner cube?

- A. 1
- B. 3
- C. 5
- \* D. 7
- E. 8

11.

The magnification of any convex mirror is:

- A. negative
- B. zero
- \* C. between zero and one
- D. greater than one
- E. More than one of the above answers is possible.

12.

The magnification of any concave mirror is:

- A. negative
- B. zero
- C. between zero and one
- D. greater than one
- \* E. More than one of the above answers is possible.

13.

A real object on one side of a lens forms a real image on the other side. Which statement is false?

- A. The image is inverted.
- B. The diverging object rays are converged by the lens.
- \* C. The focal length of the lens is negative.
- D. The focal length of the lens is less than the object distance.

14.

What can be said about the image of a virtual object by a converging lens?

- A. It is located beyond the position of the virtual object.
- \* B. It is real.
- C. Both of the above.
- D. Neither of the above.

15.

A magnifying glass is placed a focal length away from an object. Where is the image located?

- A. at the lens
- B. at the focal point on the other side
- C. wherever the observer stands
- \* D. at infinity

16.

What kind of glasses does a near-sighted person need?

- A. positive lenses
- \* B. negative lenses

17.

Dispersion occurs when:

- A. there is total internal reflection

- \* B. the index of refraction is wavelength dependent
- C. there is a virtual image
- D. the incident beam is not refracted

18.

For large enough angles of incidence, light traveling from a medium of high refractive index toward one of low index is:

- A. totally polarized
- \* B. totally reflected
- C. totally dispersed
- D. totally absorbed

19.

The reflected rays from a mirror appear to diverge from a point behind the mirror. This is called:

- A. a real image
- B. a focal point
- \* C. a virtual image
- D. spherical aberration

20.

Which of the following rays cannot normally be used to locate an image by ray tracing?

- A. a ray traveling toward the center of curvature of the mirror
- B. a ray incident parallel to the principal axis

C. a ray traveling toward the focal point

D. a ray incident on the apex of the mirror on its axis

\* E. All of the above rays can be.

21.

A single lens for which  $M > 1$  makes an image that is:

\* A. virtual and upright

B. virtual and inverted

C. real and upright

D. real and inverted